DETERMINANTS OF UNDER FIVE MORTALITY OF ODISHA: NFHS-4 DATA ANALYSIS

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ABSTRACT

This study uses Nfhs-4 data to identify the correlations of under-five child mortality in Odisha, a crucial indicator for community health and economic development. A logistic regression model was used to investigate the impact of selected socioeconomic, demographic, health, and environmental factors on Odisha's child mortality (U5CM). The age of the mother covariates preceding birth interval, place of delivery, breast feeding, mother's education level, toilet facility, number of household members, caste, and source of drinking water. According to the results of data, which are the most important factors of children's death among numerous chosen socioeconomic levels of women. According to the Logit regression study, policymakers should encourage maternal education, late marriage, and increasing birth intervals through family planning to minimize child mortality.

KEYWORDS: Under Five Mortality, Logistic Regression, NFHS -4 Data

INTRODUCTION

With 42 million residents, Odisha is the eighth largest state in India. Of them, just 17% live in urban areas, while the bulk of them live in rural regions. It boasts the nation's third-largest tribal population (Deshingkar, 2010). Scheduled Tribes and Scheduled Castes make up about 40% of the population of Odisha, according to the 2011 Census. The state is home to thirteen vulnerable tribal tribes. It is well known that the under-five mortality rate (U5MR) is an important indication of socioeconomic growth and the success of health and welfare efforts (Kumar et al, 2012).

It is commonly defined as the likelihood of dying between birth and the age of five, expressed per thousand live births (Smith, 2001). According to 2010 estimates, over 7.6 million children under the age of five die worldwide, with a significant concentration of deaths in poor nations in Sub-Saharan Africa and Southern Asia (Liu et. al, 2016).

The U5MR in 2015-16 was 50 deaths per 1000 live births, according to the most recent wave of the National Family Health Survey (NFHS 4), The Indian equivalent of the global Demographic Health Survey (DHS). This implies that India's U5MR score was closer to the MDG target of 41 deaths per thousand live births. While this sends a hopeful message, the core issue is the disparity in survival rates among locations and socioeconomic categories. Under-5 mortality is to be reduced to no more than 25 deaths per 1,000 live births by the post-2015 sustainable development agenda (Naline & Viswanathan (2019).

India may accomplish this aim in aggregate, but what will the amount of U5MR be in different states and socioeconomic groups? This article focuses on Odisha, which is one of the poorest states in India in terms of socioeconomic development.

Period	Odisha			India		
Survey	Total	Rural	Urban	Total	Rural	Urban
NFHS-1(1993)	131	135.1	107.2	109.3	119.4	74.6
NFHS-2(1998-99)	104.4	104.8	-102	94.9	103.7	63.1
NFHS-3(2005-06)	90.6	97.1	50.1	74.3	82	51.7
NFHS 4 (2015-16)	48.6	52.6	25.2	49.7	55.8	34.4

Source: IIPS and ICF, (2017)

Table 2

According to Kundu et, al., (2018) reveals that, an overview of U5MR trends in Odisha over the previous 20 years is provided by all rounds of the National Family Health Survey. (Table 2). The mortality rate for children under the age of five has decreased from 131 fatalities per 1000 live births in 1992-1993 to 104.4 in 1998 -1999 and 90.6 in 2005-06. In 2015 - 16, it dropped to 48.6.

The U5MR has dropped by roughly 82.4 points over the previous two and a half decades (from NFHS-1 to NFHS-4, Figure 1). Children under the age of five have a better probability of surviving in Odisha. As a result, Odisha's U5MR was lower than the national average. While the rural-urban divide in U5MR has narrowed in Odisha, it remains significant.

OBJECTIVE:

This study examines the predictors of child mortality in Odisha.The specific objective of this study is to identify the factors affecting child mortality through logit regression model and to suggest the relevant policy implications in order to reduce child mortality in Odisha.

DATA SOURCE AND METHODOLOGY:

To fulfil the aforementioned goals, data from the Odisha National Family Health Survey (NFHS-4) is used. The survey

Year	Odisha				India			
	Total	Rural	Urban	Rural-Urban Gap	Total	Rural	Urban	Rural-Urban Gap
1990-94*	148	154	89	65	114	124	72	52
1995-99**	127	131	86	45	102	112	63	49
2000-04**	107	110	72	38	86	95	52	43
2005-09**	91	96	56	40	71	79	45	34

Sources: India, Registrar General (1998 & 2012)

Table 1

draws a representative sample of women of reproductive age by presenting a questionnaire and collecting information on women and their children born within the previous five years (index child). The NFHS-4 sample was chosen using a stratified, two-stage cluster design, with enumeration regions serving as sampling units in the first stage. For the NFHS-4, a representative sample of roughly 11,106 women who had delivered a child during the previous five years of the survey date (index child) was chosen for study.

Variables selected for analysis:
Religion, caste, mothers' employment position, prior birth interval, mother's age at child delivery, site of residence, mother's education level, family economic status (wealth index), water supply, and toilet facility are among these determinants. U5CM is the outcome (response) variable in this study.

$$U5CM = \begin{cases} 1, & if\ under\ five\ child\ mortality\ occurs \\ 0, & otherwise \end{cases}$$

Method of statistical analysis
Logistic regression analysis applies multiple regression analysis approaches to research scenarios in which the outcome variable is categorical. Logistic regression predicts a discrete result, such as group membership, from a collection of predictor variables that might be continuous, discrete, dichotomous, or a combination of any of these (Gellman and Hill. There are two primary applications for logistic regression: First, anticipate the group membership (Menard, 2010).

Since logistic regression assesses the likelihood of success over the probability of failure, the study yields an odds ratio. Second, logistic regression gives insight into the correlations and strengths of the variables.

The Logit regression equation is presented below to explain the correlates of under - five child mortality in the United States.

$$\text{Logit}(\pi_i) = \log\left(\frac{\pi_i}{1-\pi_i}\right) = (\beta_0 + \beta_i x_{i1} + \cdots + \beta_p x_{ip}) \qquad (2)$$

The associated log-odds' change is represented by the coefficient. Researchers (Hobcraft, McDonald, and Rutstein (1984), Stallings, 2004 reference) identified maternal education as a surrogate measure of socioeconomic status among the socioeconomic factors they examined. When a kid exhibits symptoms of any illness, a mother who has received education is believed to be more likely to consult a healthcare professional for guidance or even treatment. A well-educated woman, according to Root (2001), may be able to use health resources more successfully than an illiterate mother.

Similarly, it has been reported that the mother's career position (Mustafa & Odimegwe, 2008; Indian references here), home environmental factors, cleanliness, and sanitation difficulties (United Nations, 2017; WHO 2017; UN Water, 2015) have an influence on U5M in a community. Biological characteristics linked to the mother, such as inter-birth interval, breast feeding practices, and her age at delivery, are only a few of the countless factors influencing child mortality, according to the researchers' sources.

The analysis was done in two steps. Tables 1 and 2 show the results of a cross-tabulation of selected socioeconomic, environmental, and biological factors with child survival status (Child Survived No/Yes). The logit regression model was used to explore the socioeconomic and biological components impacting child survival status, and the findings are shown in

Table 3. To assess child survival status in Odisha, three logit regression runs were performed using: 1. all chosen socioeconomic, environmental, and biological factors; 2. socioeconomic and environmental variables, and 3. biological Variables. These three models will show the impact of three sets of factors influencing child mortality, both separately and in combination.

Statistical Interpretation

Table(i)				
		Child Survival		
		Number/Percent		Total
Socio Economic Variable	Variable	No	Yes	
Age of the Respondent	< 30 years	318(4.1)	7468(95.9)	7786
	>30 years	193(5.8)	3127 (94.2)	3320
$\chi^2 = 15.852, p<.001$				
Literacy	Illiterate	223(6.5)	3198(93.5)	3421
	Literate	288(3.7)	73.97(96.3)	7685
$\chi^2 = 41.410, p<.001$				
Wealth Index	Poor	405(5.4)	7031(94.6)	7436
	Middle	68(3.4)	1924(96.6)	1992
	Rich	38(2.3)	1640(97.7)	1678
$\chi^2 = 39.376, p<.001$				
Religion	Hindu	476(4.6)	9801(95.4)	10277
	Non Hindu	35(4.2)	794(95.8)	829
$\chi^2 = .293$ NS				
Caste	Caste	374(4.3)	8374(95.7)	8748
	Tribe	137(5.8)	2221(94.2)	2358
$\chi^2 = 9.967$ p<.001				
Currently Working	Not Working	60(3.9)	1466(96..1)	1526
	Working	19(6.7)	266(93.3)	285
$\chi^2 = 4.305$ p<.05				
Household Environment variables	Number of HH members 1-3	156(10.2)	1372(89.8)	1528
	4-6	280(4.0)	6677(96.0)	6957
	7+	75(2.9)	2546(97.1)	2621
$\chi^2 = 132.828$ p<.001				
Source of Water	Protected source	413(4.5)	8853(95.5)	9266
	Unprotected source	98(5.3)	1742(94.7)	1840
$\chi^2 = 2.641$ NS				
Toilet Facilities	Protected facility	97(3.2)	2978(96.8)	3075
	Unprotected facility	414(5.2)	7617(94.8)	8031
$\chi^2 = 20.275$ p<.001				

Mother's age and under-five mortality rates
With a chi-square of 15.852, the findings demonstrate a statistically significant relationship between mother age and under-five mortality. The findings also indicate that 5.8% of fatalities were caused by women between the ages of 30 and 48, while 4.1% of deaths were caused by mothers under 30.

Mother education and mortality in children under five
With a chi-square of 41.410, Table 1.1 indicates that the relationship between a mother's educational attainment and under-five mortality is statistically significant at the 95% confidence level. Children born to mothers with no education had a higher death case rate (6.5%) than children born to mothers with either an elementary or secondary education. Moms with a secondary or higher degree of education had fewer reported deaths. Other studies have produced similar findings, indicating that a greater degree of education is related to reduce mortality.

Maternal wealth and mortality in children under five
As seen in Table 1.2, financial status has a significant impact on the likelihood of under-five mortality. Rich households are claimed to have a lower likelihood of under-five mortality than impoverished households (5.4%). According to the findings, babies born to mothers from the lowest and poorest families had a greater mortality rate than those born to mothers from middle-income, wealthier, and richest households. The results of the research demonstrate that the variable has a statistically significant relationship with under-five mortality at a 95% confidence level, with a chi-square of 39.376.

Mother's household religion and under-five mortality
According to statistical research, there is no link between religion and under-five mortality.

Mother's household caste and under-five mortality
The reported under-five child mortality rate is 5.8% among scheduled tribes and 4.3% among other castes. The chi square score of 9.967 indicates that there is statistical relevance between caste and under five child mortality.

Working mother and under five mortality
The results showed that working mothers had a higher reported under-five mortality rate (6.7%) than did non-working mothers (3.9%). At the 95% confidence level, the result demonstrated a statistically significant correlation with under-five mortality, as indicated by a Chi-square of 4.305. This correlation may be attributed to the fact that working mothers are too busy to care for their children and breastfeed them, forcing them to use less nutritious alternatives like cow's milk.

No. of Household members and under - five mortality
The larger the family members, the fewer the fatalities under five, as just 2.9% of cases are documented for family members more than seven, and 4% of cases are reported for family members between four and six members, whereas 10.2 instances are reported for one to three family members. The result indicates that there is statistical significance between household size and under five mortality, with a computed chi-square value of 132.828.

Water sources and mortality in children under five
The source of water has an effect on the child's health. According to the table, greater child death rates were seen in families that used an improved source of water (4.5%), whereas the lowest mortality rates were observed in households that used unimproved sources of water (5.3%). The finding is similarly statistically significant in terms of under-five mortality at a 95% confidence level, with a Chi-square of 2.641.

Toilet type and mortality among under-fives
A household's choice of toilet has also been connected to mortality among children under five. The results show that a child born into a household without upgraded toilets has a higher risk of dying than a child born into a household with upgraded toilets. Children under the age of five born into homes with unimproved toilets had a 5.2% chance of dying, compared to a 3.2% chance for families with improved facilities. The findings of this investigation indicated differently, since the variable had a statistically significant connection with under-five mortality (chi-square 20.275).

Table (ii)

Biological Variables	Variable	Child Survival Number/Percent No	Child Survival Number/Percent Yes	Total
Feeding	Breast feeding	149(1.7)	8502(98.3)	8651
	Never Breast feeding	177(30.9)	396(69.1)	573
$\chi^2=1341.019$ p<.001				
Place of Delivery	Home	114(6.8)	1555(93.22)	1669
	Institutional	382(4.1)	9040(95.9)	9422
$\chi^2=25.577$ p<.001				
Birth Interval	<24 months	65(6.8)	886(93.2)	951
	24-48 months	124(3.9)	3021(96.1)	3145
	48+	98(4.4)	2154 (95.6)	2252
$\chi2 =14.381$ p<.001				

Analysis Results: NFHS 4 Data

Variables	Model I Exp (β)	Model I 95%CI LL-UP	Model II Exp(β)	Model II 95%CI LL-UP	Model III Exp(β)	Model III 95%CI LL-UP
Age of Respondent < 30 years(ref) >30 years						
Literacy Illiterate(ref) Literate			1.000 1.755	1.082-2.848*		
Wealth Index Poor(ref) Middle Rich	1.000 6.035 3.807	1.238-29.148* 0.789-18.353	1.000 1.332 4.540	0.694-2.557 1.376-14.98*		
Religion Hindu(ref) Non Hindu						
Caste Caste(ref) Tribe						
Currently Working Not Working(ref) Working						
Number of HH members 1-3(ref) 4-6 7+			1.000 2.156 2.850	1.249-3.721** 1.390-5.842**		
Source of Water Protected source(ref) Unprotected source						
Toilet Facilities Protected facility(ref) Unprotected facility						
Breast Feeding Breast feeding(ref) Never Breast fed	1.000 0.035	0.015-.079**			1.000 0.056	0.040-.076
Place of Delivery Home(ref) Institutional					1.000 1.545	1.090-2.190
Preceding Birth Interval <24 months(ref) 24-48 months 48+	1.000 3.426 0.890	1.075-10.919 0.306- 2.589			1.000 1.692 1.298	1.117-2.564 0.852-1.97
N R square, final step -2Logliklihood,Const.	0.232 193.263 27.917**		0.053 620.335, 6.635**		0.189 1369.19, 24.839***	
Variables entered in Step:1 Step:2 Step:3						

Step:1	Breast Fed	Literacy	Breast Fed
Step:2	Preceding Birth Interval	Num HH Members	Place of delivery
Step:3	Wealth Index	Wealth Index	Preceding Birth Interval

*p<.05, **p<.01 , ***p<.001

Table: 3: Socio Biological variables influencing Child Survival in Odisha: Logit regression

Infant mortality and breastfeeding
Breastfeeding for a longer period of time is one factor impacting mortality among children under five. A Chi square value of 1341.09 showed that 30.09% of children who were never nursed died, whereas only 1.7% of children who were always breastfed died. These findings were judged to be statistically significant.

Birthplace and mortality for children under five
The study found that the location of birth had an impact on child death rates. Institutional health facilities had lower fatality rates (4.1%) than at home, where the likelihood was 6.8%. The findings indicate that there was statistical significance related to under-five mortality, with a chi-square of 25.577.

Birth interval and under-five mortality
Children born fewer than 24 months after a prior birth had an under-five death rate of 6.8%, while children who were born more than a year after their sibling and less than 48 months had a reduced mortality rate of 3.9%, with only 4.4% observed over 48 months of birth gap. With a Chi-square of 14.381, the outcome, with a 95% confidence level, is statistically significant.

Multivariate analysis of risk factors for under-five mortality results
Model I demonstrates that wealth status has less of an impact on the chances of survival for children under the age of five. The data indicate that breastfeeding is a statistically significant factor in determining the death of infants under five years of age, even when compared to children born into rich households. The data demonstrate a significant reduction in under-five mortality in moms who did not breastfeed. According to reports, the decrease rate in under-five mortality is 97%. (Odds ratio of 0.035).

After adjusting for socioeconomic variables, Model II evaluates the influence of sociobiological factors. According to the above table, the odd ratio of under-five mortality is influenced by 75% (odd ratio 1.755) for educated moms. These findings are statistically significant, indicating that moms with a degree of education are more likely to have children who die before the age of five than those with no education. According to the findings,

household members had a large influence on under-five mortality, with a 15% (Odd ratio 2.156) reduction for families with four to six members and an 85% (Odd ratio 2.850) reduction for families with seven or more members.

The Model III The results indicated that children of mothers who gave birth in public health facilities were more likely to die before the age of five than children whose mothers gave birth in private health facilities. Yet, at home, it displays a 54% decrease rate (odds ratio 1.545).

CONCLUSIONS

Using a logistic regression model, the study finds the key determinants of under-five child mortality in Odisha. It used nationally representative data from the National Family Health Survey (NFHS-4) data. The study discovered that socioeconomic, demographic, health, and environmental factors all had a substantial impact on under-five child mortality in Odisha. Using a logistic regression model, the predictors of prior birth interval, mother's education level, toilet facility, household size, and source of drinking water are key drivers of under-five child mortality in the state.

Moms with elementary and higher level education were less likely to have under-five child mortality than those with no formal education. Also, the study found that when the period between births grows, the risk of child death reduces. Additionally, the findings revealed that children from higher birth orders and larger family sizes are more sensitive to the Odisha mortality problem. In light of the foregoing observations, we urge that efforts be made to improve access to education and health care for parents in order to close the gap in under-five child mortality.

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